

Spot Safety Project Evaluation

Project Log # 200512200

Spot Safety Project # 13-95-209

**Spot Safety Project Evaluation of the Channelization Improvements at US 19/23 and SR 1245
(Acton Circle) and the Shoneys/McDonalds' Driveway
Buncombe County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Brad Robinson, EI

9/28/2007
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 13-95-209 – US 19/23 (Smokey Park Hwy) at SR 1245 (Acton Cir) and the Shoneys/McDonalds' Driveway in Buncombe County.

Project Information and Background from the Project File Folder

There were several improvement countermeasures chosen for the subject location. The purpose of the project was to force left turning motorists from the Shoneys/McDonalds' driveway to instead access SR 1245 (Acton Circle). To do so, the radius for the driveway was increased and a raised median "porkchop" was installed at the driveway, with a no left turn sign installed next to it. A small raised median was also constructed in the median of US 19/23 across from the driveway. These improvements would require left turning motorists to instead access the driveways on SR 1245.

In the before period, SR 1245 was an unsignalized intersection at US 19/23. There was a raised median on US 19/23 from just after the Shoney's/McDonald's Driveway up to the I-40 off ramp, therefore forcing SR 1245 traffic to turn right. As part of the project the raised median was removed, instead creating a left turn lane for access onto SR 1245. The existing signal plan for the I-40 off ramps (just east of SR 1245) was revised to include signalization for SR 1245. Please see the two *Collision Diagrams* for a visual representation of both the before and after periods.

The final completion date for the improvements at the subject intersection was on October 19, 1998 with a total cost of \$75,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from August 1, 1998 to December 31, 1998. The before period consisted of reported crashes from April 1, 1990 through July 31, 1998 (8 years and 4 months) and the after period consisted of reported crashes from January 1, 1999 through April 30, 2007 (8 years and 4 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes from 150 feet west of the subject driveway to just west of the I-40 off ramp on US 19/23 (approximately 350 feet). It also consisted of all reported crashes on SR 1245 from the subject intersection to 150 feet north of the McDonald's Driveway (approximately 400 feet). Crashes that occurred on the ramps or involving traffic exiting the off ramp and colliding with US 19/23 traffic were not included.

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note Left Turn-Different Roadway and Angles Crashes involving traffic crossing US 19/23 from the Shoneys/McDonalds' driveway were the Target Crashes for the applied countermeasures.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	69	52	-24.6
Total Severity Index	9.71	5.73	-41.0
Target Crashes	41	3	-92.7
Target Crash Severity Index	8.13	31.20	283.8
Volume	28,000	24,000	-14.3
<u>Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	5	1	-80.0
Class B Crashes	10	6	-40.0
Class C Crashes	20	17	-15.0
PDO Crashes	34	28	-17.6

The naive before and after analysis at the treatment location resulted in a 25 percent decrease in Total Crashes, a 93 percent decrease in Target Crashes, and a 14 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 1994 and the after period ADT year was 2003.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 25 percent decrease in Total Crashes and a 93 percent decrease in Target Crashes. The Total Severity Index decreased by 41 percent and the Target Crash Severity Index increased by 284 percent. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

The high increase in the Target Crash Severity Index can be misleading. There were only three Target Crashes in the after period, resulting in one "A", one "B", and one "C" injury crash.

Referencing the *Collision Diagrams* and the above table, it is apparent that the countermeasures were successful in reducing the amount of left turning traffic from the subject driveway, although they didn't completely eliminate the movement.

It is also apparent from the *After Period Collision Diagram* that a new crash pattern developed at the intersection of SR 1245 and US 19/23. In the after period there were 25 Crashes that were

either Left Turn-Different Roadway or Angle Crashes involving vehicles attempting to cross US 19/23 from SR 1245.

Approximately half (12 out of 25) of these crashes involved a vehicle which originally turned right from the I-40 off ramp and hit a vehicle entering the intersection from SR 1245. In all 12 of these crashes either the vehicle that turned from I-40 was found at fault or fault was not able to be determined. The signal plan is designed so that if a vehicle from the I-40 ramp makes a right turn on red onto US 19/23 then it is also essentially running the westbound red light, when SR 1245 has a green light. For this reason a “No Right Turn on Red” sign is displayed at the signal for the I-40 ramp. On the crash reports, several drivers stated that they turned right on red, although others claimed they had a green or yellow. According to the signal-timing chart, there is a 1.5-second red clearance between the phase that allows for right turns from the I-40 ramp and the green phase for SR 1245. It is possible that some of the crashes occurred due to drivers turning right from the ramp just after the red signal, thinking that they could clear the intersection before other vehicles entered.

Even though the crash pattern seems to have migrated from the Shoneys/McDonalds’ driveway to the SR 1245 intersection, it still has experienced a 32 percent decrease. In the before period there were 41 Angle/Left Turn-Different Roadway Crashes at the driveway. In the after period there was a total of 28 (3 at the driveway and 25 at SR 1245) Angle/Left Turn-Different Roadway Crashes involving vehicles attempting to cross US 19/23.

There was also a small pattern of Rear-Ends and Sideswipe-Same Direction Crashes on westbound US19/23 just before the subject driveway due to vehicles attempting to either make a U-turn around the raised median or to turn left onto the I-40 on ramp (Before Crash #s 1, 27, 30, 46, 51, and 58). This pattern was eliminated in the after period. This reduction can probably be attributed to two things. First, the new raised median island across from the driveway prevents left turns onto the I-40 ramp. Secondly, vehicles coming from SR 1245 now have full movement and therefore can either turn left or enter I-40 without first having to turn right.

The calculated benefit to cost ratio for this project is 22.61 considering total crashes. The benefit to cost ratio considering only target crashes is 9.28. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of roadway.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 19/23 at SR 1245 and McDonald's Drive	BY: Brad Robinson
COUNTY: Buncombe	DATE: 9/18/2007
FILE NO.: SS 13-95-209	

DETAILED COST: TYPE IMPROVEMENT - Various Channelization

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$75,000	10	0.149	\$11,177
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$75,000	10	0.149	\$11,177
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$0
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$12,077
TOTAL COST OF PROJECT=	\$75,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	8.34	5	0.60	30	3.60	34	4.08	\$402,806
AFTER	8.34	1	0.12	23	2.76	28	3.36	\$129,712

Annual Benefits from Crash Cost Savings	\$273,094
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NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST	=	\$261,016
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST	=	22.61

TOTAL COST OF PROJECT	-	\$75,000	COMPREHENSIVE B/C RATIO	-	22.61
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BENEFIT-COST ANALYSIS WORKSHEET TARGET

LOCATION: US 19/23 at SR 1245 and McDonald's Drive	BY: Brad Robinson
COUNTY: Buncombe	DATE: 9/18/2007
FILE NO.: SS 13-95-209	

DETAILED COST: TYPE IMPROVEMENT - Various Channelization

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$75,000	10	0.149	\$11,177
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$75,000	10	0.149	\$11,177
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$0
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$12,077
TOTAL COST OF PROJECT=	\$75,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

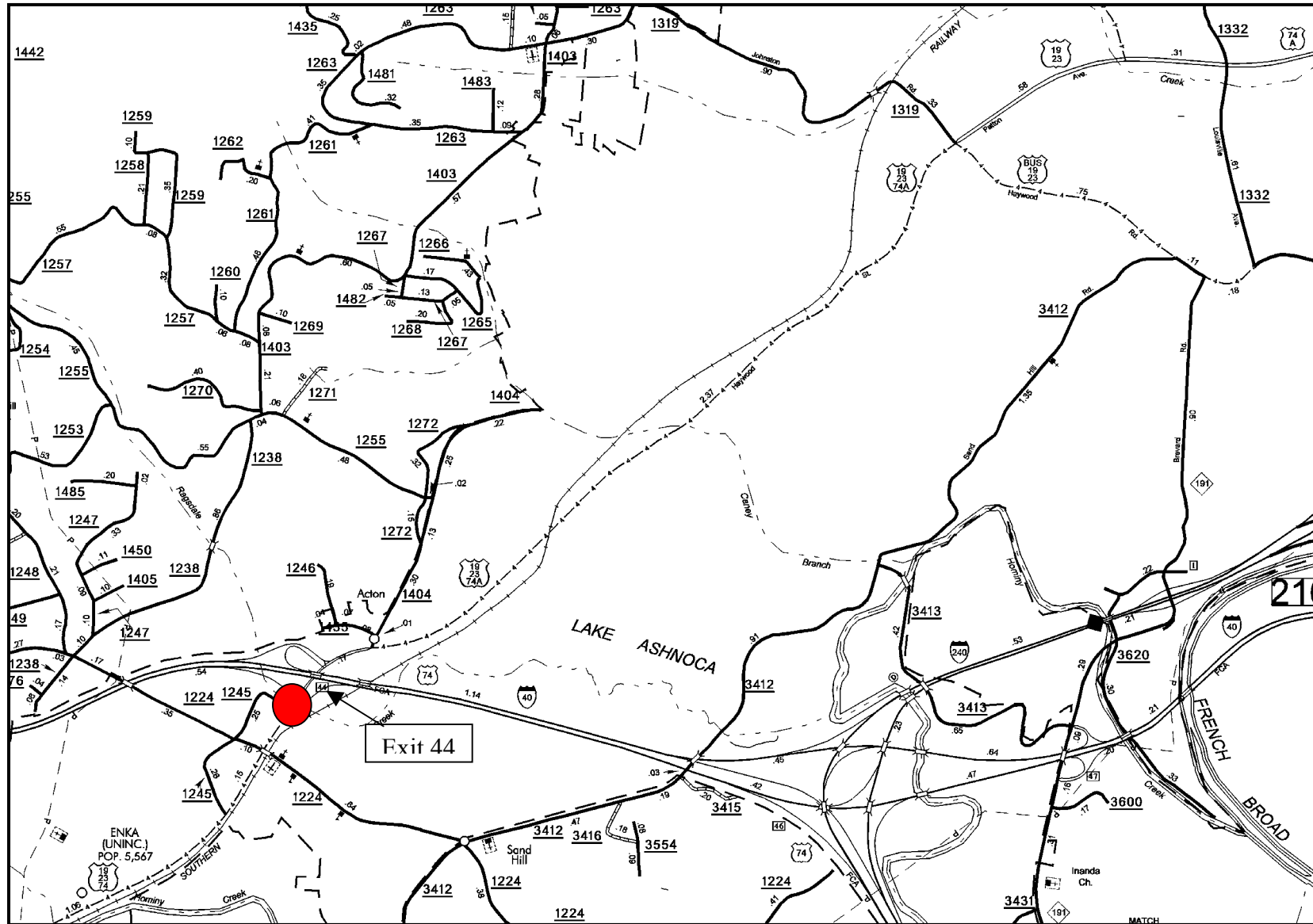
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	8.34	2	0.24	19	2.28	20	2.40	\$180,216
AFTER	8.34	1	0.12	2	0.24	0	0.00	\$68,106

Annual Benefits from Crash Cost Savings	\$112,110
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NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST	=	\$100,033
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST	=	9.28

TOTAL COST OF PROJECT	-	\$75,000	COMPREHENSIVE B/C RATIO	-	9.28
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Location Map
Buncombe County
Evaluation of Spot Safety Project #13-95-209



Treatment Location: US 19-23 (Smoky Park Hwy) at SR 1245 (Action Circle) and Shoney's-McDonald's Driveway near Asheville

Treatment Site Photos Taken July 17, 2007



Driving East on US 19/23, Approaching Subject Driveway



Facing East on US 19/23 in Front of Subject Driveway



From Parking Lot, Facing US 19/23

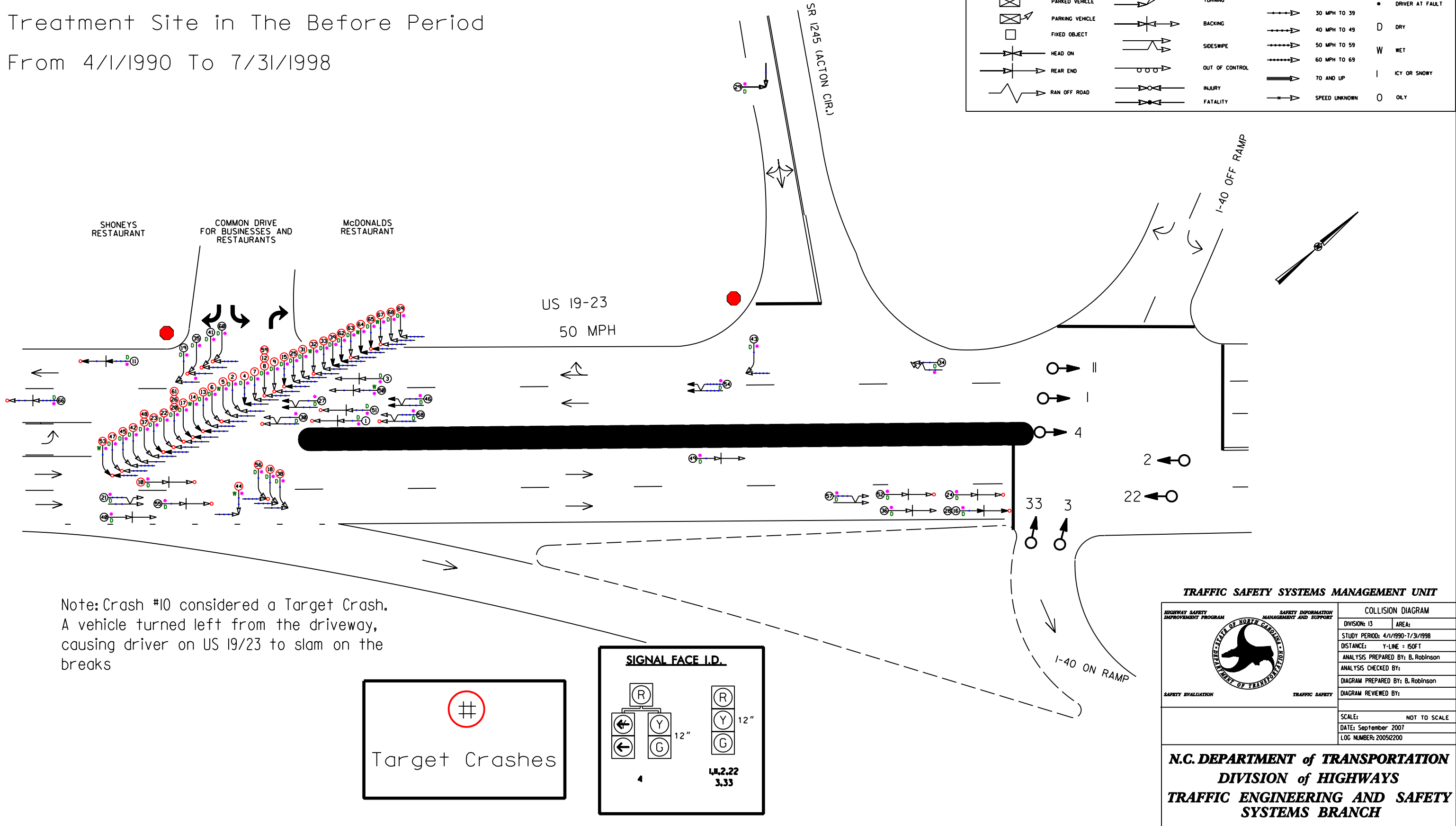


At Driveway, Looking at US 19/23



Driving Southeast on SR 1245 (Acton Circle) Approaching US 19/23

Buncombe County
US 19/23 at SR 1245 (Acton Circle) and Shoney's/McDonald's Driveway
Treatment Site in The Before Period
From 4/1/1990 To 7/31/1998



Buncombe County
US 19/23 at SR 1245 (Acton Circle) and Shoney's/McDonald's Driveway
Treatment Site in The After Period
From 1/1/1999 To 4/30/2007

LEGEND

→

MOVING VEHICLE

→

PEDESTRIAN

⊠

PARKED VEHICLE

⊠

PARKING VEHICLE

□

FIXED OBJECT

→

HEAD ON

→

REAR END

→

RAN OFF ROAD

—

Raised Median Channelization

↘

ANGLE

↘

TURNING

↔

BACKING

↔

SIDESWIPE

↔

OUT OF CONTROL

↔

INJURY

↔

FATALITY

→

9 MPH OR LESS

→

10 MPH TO 19

→

20 MPH TO 29

→

30 MPH TO 39

→

40 MPH TO 49

→

50 MPH TO 59

→

60 MPH TO 69

→

70 AND UP

→

SPEED UNKNOWN

P

PEDESTRIAN

T

TRAIN

*

DRIVER AT FAULT

D

DRY

W

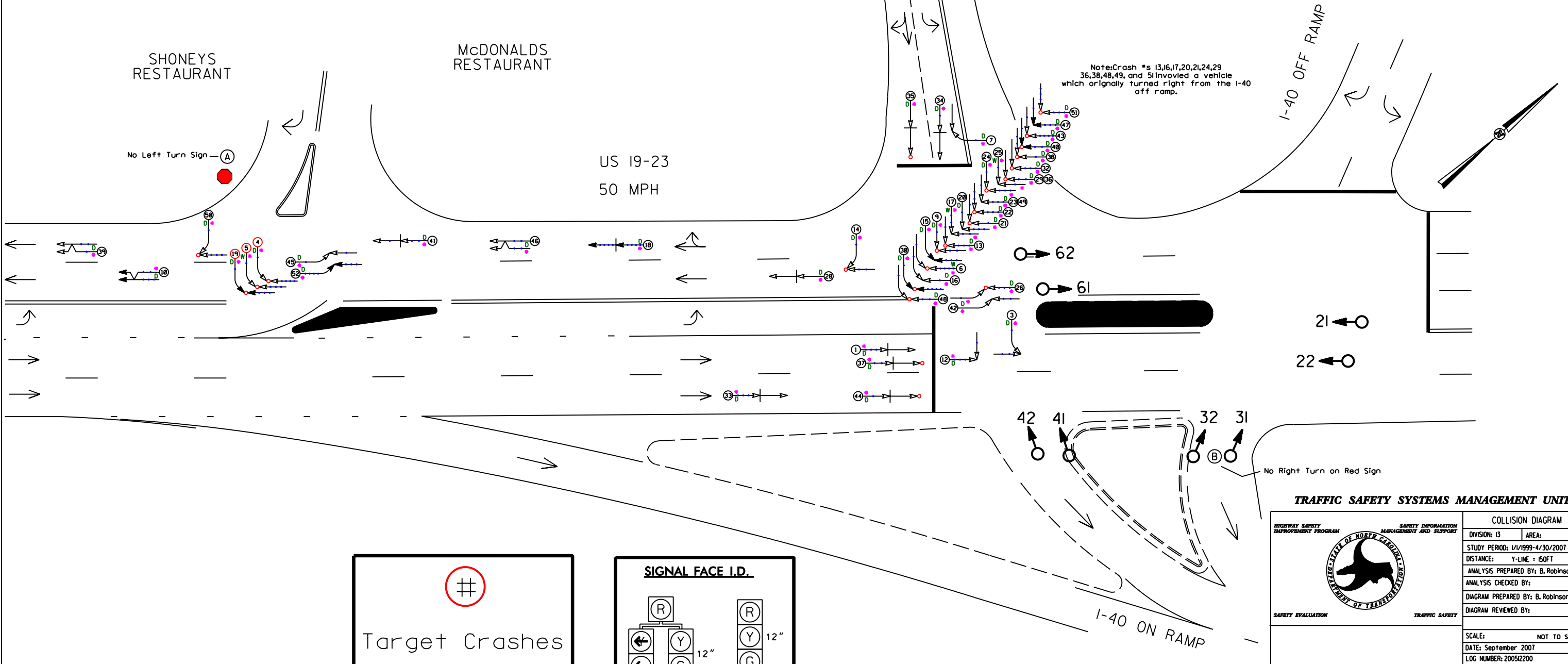
WET

I

ICY OR SNOWY

O

ONLY



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Target Crashes

SIGNAL FACE I.D.

R

←

←

Y

G

12"

61

R

Y

G

12"

21, 22
31, 32
41, 42
62

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY IMPROVEMENT PROGRAM

SAFETY INFORMATION MANAGEMENT AND SUPPORT

SAFETY EVALUATION

TRAFFIC SAFETY

COLLISION DIAGRAM

DIVISION: 13

AREA:

STUDY PERIOD: 1/1/1999-4/30/2007

DISTANCE: 1-MILE ± 150 FT

ANALYSIS PREPARED BY: B. Robinson

ANALYSIS CHECKED BY:

DIAGRAM PREPARED BY: B. Robinson

DIAGRAM REVIEWED BY:

SCALE: NOT TO SCALE

DATE: September 2007

LOG NUMBER: 200512200

N.C. DEPARTMENT of TRANSPORTATION

DIVISION of HIGHWAYS

TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH